



*Advanced
Materials
Solutions*

Department of Energy SBIR Phase I: Flow Channel Inserts for Dual-Coolant ITER Test Blanket Modules

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**Design and Modeling Support:
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Program Duration: 9 Months, Starting June 27, 2005

Program Goal

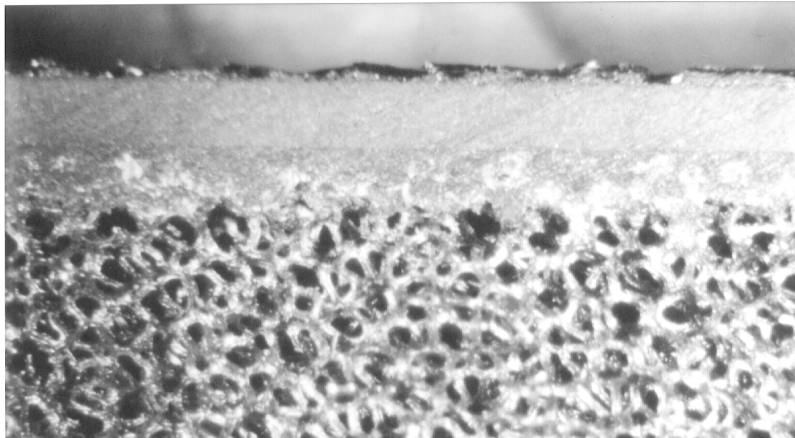


- The primary objective of this project is to develop and demonstrate the initial feasibility of a refractory, open-cell-foam-core flow channel insert that will allow a high Pb-17Li alloy tritium breeder exit temperature of $\sim 700^{\circ}\text{C}$, in support of the International Thermonuclear Experimental Reactor (ITER).

Approach & Potential Design Benefits

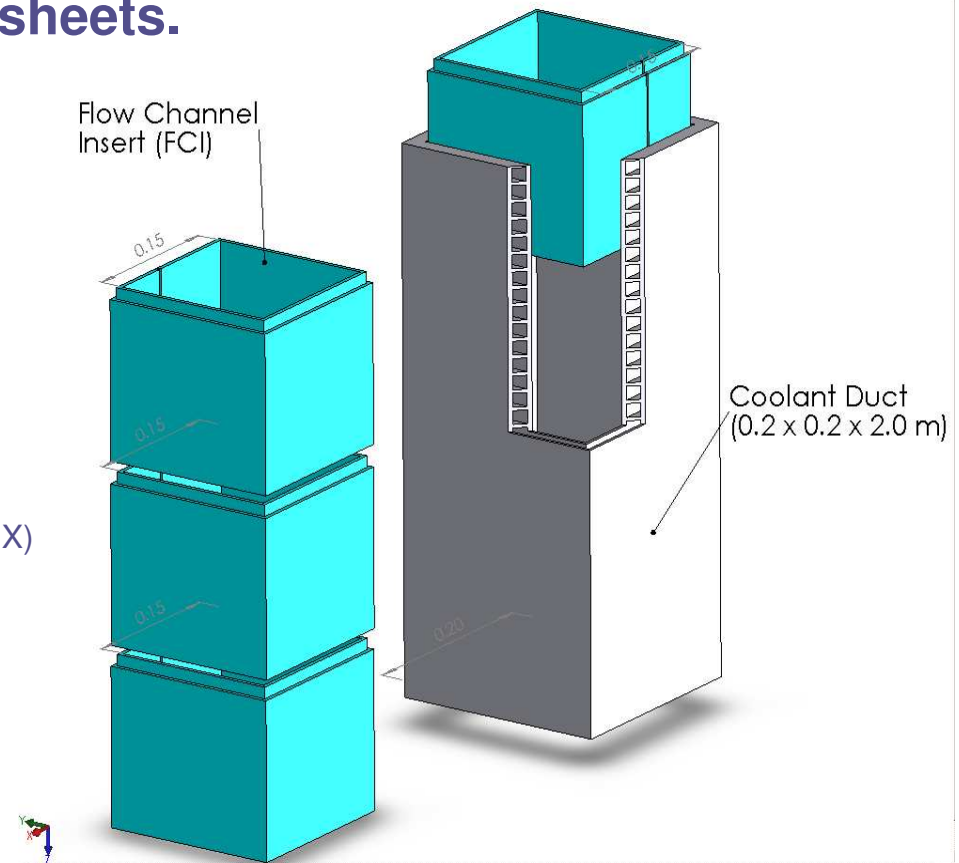


- Ultramet will fabricate a flow channel insert composed of an open-cell SiC foam primary structure with thin, integrally bonded and impermeable SiC facesheets.



CVD SiC closeout layer applied to the surface of SiC foam (20X)

- Improved manufacturability and thermal performance over SiC/SiC
- High strength, stiffness, and thermal stress resistance
- Low thermal and electrical conductivity



ULTRAMET-DMS proposed Flow-Channel Insert configuration

Phase I Statement of Work

(6/27/05-3/26/06):



- Task 1: FCI Modeling

- Thermomechanical modeling of a SiC foam core FCI component will be performed by DMS.

- Task 2: FCI Development Specimen Fabrication and Testing

- 3" diameter disk development specimens will be produced to demonstrate feasibility. A nominal facesheet thickness of 0.040" on 0.200" thick SiC foam has been initially targeted to prevent PbLi ingress and minimize thermal and electrical conductivity.

- Materials Characterization at Ultramet: SEM, EDS, XRD

- Task 3: Thermal Testing

- A preliminary indication of thermal performance will be obtained through oxyacetylene torch testing. Testing will be performed by imposing a relatively small-diameter torch flame to the center of one face, and a minimum 1000 °C surface temperature will be generated.

- Task 4: Reporting